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STATEMENT OF
MR. JAMES E. WEBB
ADMINISTRATOR
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
BEFORE THE
SUBCOMMITTEE ON RESEARCH, DEVELOPMENT, AND RADIATION
OF THE
JOINT COMMITTEE ON ATOMIC ENERGY
August 28, 1961

Mr. Chairman and Members of the Committee:

It is a privilege to appear before this Subcommittee of the Joint Committee on Atomic Energy. During these past several months since I assumed the responsibilities as Administrator of the National Aeronautics and Space Administration, I have had the honor of working closely with your first witness, Dr. Glenn Seaborg, Chairman of the Atomic Energy Commission. We have developed a very clear understanding of the problems and opportunities before us, and a close working relationship. I have also had a long and valued, both personal and official, relationship with other members of the Commission, which has facilitated our work.

I believe that the AEC-NASA joint office, the Space Nuclear Propulsion Office, responsible for the conduct of the Rover nuclear rocket propulsion program is functioning well, to the advantage of the

program and in the best interests of the Government. In addition, the SNAP-8 program which is being conducted by NASA and the AEC is also making excellent progress and should lead to a system that will provide a capability for use with early electrical propulsion systems and for providing large amounts of auxiliary electrical power. In addition to his Rover responsibilities as Manager of the Space Nuclear Propulsion Office, Mr. Finger is charged with NASA's responsibilities in the development of SNAP-8 and in the development of the technology for high power nuclear electric systems. His position in the AEC and his location in the AEC Headquarters, therefore, permits him to coordinate all of NASA's development work on space nuclear systems directly with the Commission and Commission staff.

As Dr. Seaborg has pointed out, neither NASA nor the AEC can develop space systems utilizing nuclear energy sources without intimate collaboration with the other agency. The strong capabilities of the AEC in the nuclear technology area are clearly demonstrated by the outstanding people and accomplishments of the Los Alamos Scientific Laboratory in the Rover program. The NASA capabilities in rocket engine systems and vehicle and launch operations are basic parts of the Lewis Research Center and the Marshall Space Flight Center. It is important that I point out that the research work that was used as the basis for initiation of development, in October, 1958, of the Centaur engine, our first hydrogen-oxygen engine, was conducted principally at the Lewis Research Center. During 1956 and 1957, Lewis ran extensive tests on

a 20,000 pound thrust, hydrogen-oxygen motor that was completely self cooled. In addition, the Lewis Research Center conducted the first tests in this country of a self-cooled hydrogen-fluorine rocket motor on November 22, 1957. These programs have established Lewis as the foremost Government organization in the field of cryogenic flow systems such as are required in nuclear rockets. In addition, the Plum Brook Reactor provides us with a capability to investigate the effects of nuclear radiation on the components of such flow systems and on engine and vehicle materials.

The Marshall Space Flight Center under the direction of Dr. Wernher von Braun is, I am sure, well known to the members of this Committee. The von Braun team is responsible for technically directing the development of and building or procuring our large chemical rocket vehicles. They are developing the first stage of the Saturn million and one-half pound thrust launch vehicle and will proceed on to the larger vehicles. The Saturn first stage has gone through several successful static firings at Marshall and it is now at Cape Canaveral, being prepared for flight testing. The first flight test is scheduled in the fall of this year.

In addition to these Government and National Laboratory capabilities, the AEC and NASA have selected the Aerojet-General Corporation and the Westinghouse Astronuclear Laboratory for the first phase of the development of the NERVA engine which will be this Nation's first nuclear engine for rocket vehicle application, and we hope it will be the first in the

world. I believe, therefore, that through this Government-National Laboratory-Industry association, we have established a broadly based, highly competent team to execute a sound technical program with the greatest possible assurance of success.

The nuclear rocket program must be a strong part of our over-all space program, the objectives of which have been defined by the President in his May 25 budget message and have been approved by the Congress in the action that has been taken on our authorization and appropriation bills. The goals that have been defined are firm, long-term goals that will have a profound beneficial effect upon the technological strength of this country, and, therefore, upon its economic strength and its position in the world. The President defined as one of our major objectives a manned exploration of the moon during this decade. He emphasized the importance of the timing of the mission when he said that, "while we cannot guarantee that we shall one day be first, we can guarantee that any failure to make this effort will make us last."

Many approaches are possible to the conduct of this manned lunar mission; solid propellant vehicles are in competition in this area with liquid propellant chemical rocket vehicles. We are working closely with the Department of Defense in pursuing both of these approaches. The mission can be done with a vehicle that goes directly from the Earth to the moon or it can be done with smaller, lower thrust vehicles if the manned spacecraft subsystems rendezvous and are assembled in space.

This country has, since March 16, 1926, when Dr. Goddard launched the world's first liquid fueled rocket, been developing a long background of technology in chemical combustion rockets. Although new problems arise with increased size and new propellants, particularly in the technology field, the scientific principles we work with are not basically new. As we view it at this time, because of our long experience in this area, we must utilize existing chemical rocket technology as the primary system for our first lunar missions. It gives us the greatest assurance of being able to accomplish these missions at the earliest possible time.

We are, however, fully cognizant of the performance gains that could be achieved in delivering large payloads to the moon through the successful development and use of nuclear rocket stages combined with our chemical rocket vehicles. Mr. Finger is prepared to discuss these systems in greater detail.

As Dr. Seaborg has indicated, we cannot yet assure that the nuclear rocket technology can be successfully developed to perform the lunar landing mission during this decade. We cannot, therefore, base the attainment of our national lunar landing objective upon this advanced system. The program that has been laid out for nuclear rocket reactor design and testing during the next year may give us assurance of successful nuclear rocket development. For this reason, our chemical rocket vehicles will be mechanically designed so that nuclear stages can be applied when such stages are developed providing increased payloads for various missions including lunar missions. In this manner,

they will also provide us with an alternate approach in the event they become available sooner than expected and in the event insoluble difficulties are encountered in other approaches.

We look to the nuclear rocket primarily for application to missions beyond the first manned lunar expeditions; for providing the heavy payloads that may one day be required to support lunar bases and for manned exploration of the planets. Nuclear energy is essential for such missions. The importance of the nuclear rocket in this continuing program is apparent to all of us who recognize the stringent demands that have already been placed on the capabilities of chemical rocket systems.

The nuclear rocket program must, therefore, be pursued actively and as rapidly as the technology can be developed to provide us with the capability of performing long-range space missions. The present Rover program is now being so conducted. As an integral part of this program, we are planning to flight test the first nuclear rocket system as early as is technically feasible. Our program planning has indicated that we can perform such flight tests in the 1966 to 1967 period and we are, therefore, directing our program at meeting those dates.

In addition to the requirements of the space program for nuclear rocket development, it is apparent that there are many missions that will require the use of electrical power using nuclear energy sources. I have already mentioned the SNAP-8 program in which the AEC is developing the reactor and reactor components and NASA is developing the rest of the

system and is responsible for the integration of the reactor and these other components. Our work on electrical propulsion indicates the eventual need for power levels considerably higher than the SNAP-8 30-60 electrical kilowatts and with extremely low engine weights. We have in process an active program aimed at establishing the technology that will be required in such systems to convert from the reactor heat output to electrical power. It is clear that the development of these high power electric generating systems will determine the timing of the useful application of electrical propulsion.

At the low power end, we have asked the AEC to evaluate the feasibility of using an isotope power supply in our Surveyor program. The Surveyor is the unmanned soft lunar landing spacecraft that will provide detailed scientific information about the moon as an essential requirement preliminary to manned operations. The lightweight, small size and long-life of these isotope power supplies present certain advantages for many other space missions. NASA's project staff is now evaluating the design studies that have been performed by the AEC and its contractors to determine the feasibility of installing an isotope system in the Surveyor spacecraft.

I am convinced that the space program will benefit substantially by the technological developments based on the use of nuclear energy. Conversely, I am also convinced that nuclear technology will be greatly advanced by our efforts to incorporate such systems in our space program.

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